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IDEATIONAL BEHAVIOR OF MONKEYS AND APES

By Robert M. Yerkes

PSYCHOLOGICAL LABORATORY, HARVARD UNIVERSITY

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The reactive tendencies of two monkeys and a young orang utan have been studied by means of the method of multiple choices described in a previous communication to the Academy¹ and by certain supplementary methods.

Four multiple choice problems were presented: (1) the problem of choosing from among any group of mechanisms the one at the left; (2) the second from the right end; (3) alternately, the first at the left end and the first at the right end; (4) the middle mechanism.

Each of the three primates in question solved problem 1. One monkey (*P. rhesus*) required 70 trials; the other (*P. irus*), 132 trials. The ape succeeded only after 290 trials. The behavior of these three animals was most interesting and illuminating. *P. irus* was erratic, easily fatigued or discouraged, and apparently of low grade intelligence. *P. rhesus*, on the contrary, was alert, businesslike, intent on his task, and direct in his attack on experimental devices. The orang utan was childlike in his desire for assistance, as also in his resentment of annoyances or disappointments. He was given to settling down to a simple routine.

The accompanying figure 1 presents the curves of error for these animals as constructed from the data in connection with problem 1.

P. rhesus (Sobke) quickly and regularly eliminated mistakes and completely solved the problem. His disposition as well as his achievement, is pictured by the curve of errors.

P. irus (Skirrl) exhibited marked irregularities of performance, and the curve indicates his variable attention and effort as well as his slow progress toward success.

The orang utan (Julius) reacted uniquely, as his curve suggests. At the very outset, he developed a definite habit of response which, as it happened, was inadequate for the solution of the problem but yielded constantly 60% of correct first choices. The habit or reactive tendency was that of choosing each time the box nearest to the starting point.² Julius continued to use this method without variation for eight successive days. Then a break occurred, but after a few days he settled back into the old rut. At the end of 230 trials, it was decided to try to destroy the ape's unprofitable habit. This attempt was made by using

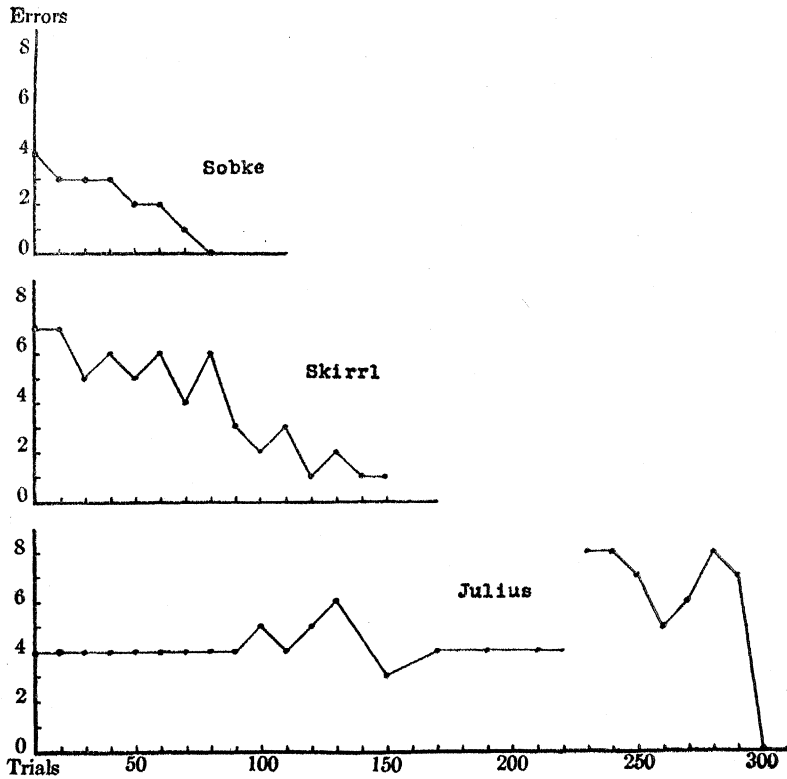


FIG. 1

as correct boxes only those to the left of the middle box of the series. The nearest box, in such case, was never the correct box. Consequently, this modification of method greatly increased, as the curve of errors shows, the number of mistakes.

For a few days after this change was made, no improvement in reaction appeared. On May 10, in a series of 10 trials, 7 were incorrect, but the following day and thereafter only correct choices appeared. Thus, suddenly and without warning, the ape solved his relational problem.

Is this the result of ideation? If not, what happened between the poor performance on May 10 and the perfect series on May 11? Because of varied results obtained in other experiments with this ape, I suspect that ideational processes developed.

The two monkeys succeeded in solving problem 2; the *P. irus* after 1070 trials, and the *P. rhesus* after 400 trials. The orang utan failed utterly, although he was given 1380 trials. Ultimately, he ceased to try to select the right box and followed the path of least resistance.

In addition to the method of multiple choices, the chiefly significant results of which cannot well be summarized, several supplementary methods of studying the adaptive behavior of monkeys and apes were employed. Chief among these are (1) a box stacking test; (2) a box and pole experiment; (3) a form of draw-in experiment.

The ape, although failing to stack boxes spontaneously in order to obtain a banana which was suspended from the roof of his cage, did so readily and skilfully when shown how to do it by the experimenter. His imitative activity was convincingly purposive. Previous to the opportunity to imitate the experimenter, he exhibited various methods of trying to get the banana. His attention was surprisingly constant, and his activity, although varied, was for the most part definitely directed toward the food. In the controlling influence of the prospective reward and in the precision of execution of his various acts, Julius differed markedly from the monkeys.

Neither monkey made systematic and sustained attempts to obtain the banana by the use of boxes. Neither imitated the experimenter and neither attended to the prospective reward more than a few seconds at a time. These statements indicate a vast gulf, psychologically, between monkey and ape.

In the box and pole experiment, the banana was so placed in the middle of a long box that it could be obtained only by the use of a pole. The ape quickly, of his own initiative and with few useless motions, succeeded in obtaining the food. The monkeys never succeeded in obtaining it by any method and failed to use the pole at all as a tool.

Similarly, in an experiment which gave the animals opportunity to obtain food by drawing it into the cage with a stick, the ape quickly and repeatedly adapted means to ends by using the stick, whereas the monkeys never once attempted to use it.

The specimen of *P. irus* (Skirrl) had a penchant for the manipulation of objects as tools. It is therefore surprising that he failed in the above experiment. When given a board, hammer and nails, he drove the nails into the board skilfully and persistently only to draw them out again and repeat the performance, for the activity was its own reward. In all probability, this use of hammer and nails was not imitative, since no other monkey or ape under observation showed any inclination to use them as did Skirrl. Quite as assiduously and with evident satisfaction, he used lock and key, and saw, or any other object which happened to fall into his hands. In the use of a saw, he persistently refused or failed to imitate the experimenter, but finally hit upon a use for the instrument which clearly gave him great satis-

faction. By holding it, teeth uppermost, with his feet and rubbing a nail or spike over the teeth rapidly, he succeeded in producing a noise which apparently delighted him. Skirrl, although pronounced feeble-minded on the basis of various studies of problem-solving ability and reactive tendencies, proved himself to be a mechanical genius.

The general conclusions which may be deduced from this limited experimental study of two monkeys and an orang utan are that the ape exhibits various forms of ideational behavior, whereas the reactive tendencies of monkeys are inferior in type and involve less adequate adaptation to factors remote in space or time. I suspect, from data now available, that both monkeys and apes experience ideas, and I believe that it will shortly be possible to offer convincing evidence of the functioning of representative processes in their behavior.

The original account of the results which have been summarized in this communication presents also a plan for a research station to be devoted to the study of the primates. It is pointed out that without scientific conscience we have permitted race after race of primitive man to disappear, unstudied by psychologist, sociologist, or anthropologist, or at best inadequately studied. The pertinent question of the comparative psychologist is "Are we also to permit the gorilla, chimpanzee, orang utan, and gibbon to disappear before we make them yield their incalculably valuable contribution to human enlightenment, welfare, and the general progress of science?"

¹ A new method of studying ideational and allied forms of behavior in man and other animals, these PROCEEDINGS, 2, 631, (1916).

² In the apparatus used for these observations, the boxes were placed in a straight line instead of on the arc of a circle. Consequently, the distance from the starting point increased from the center of the series toward the ends.

THE OSMOTIC PRESSURE AND LOWERING OF THE FREEZING-POINT OF MIXTURES OF SALTS WITH ONE ANOTHER AND WITH NON-ELECTROLYTES IN AQUEOUS SOLUTIONS

By William D. Harkins, R. E. Hall, and W. A. Roberts

KENT CHEMICAL LABORATORY, UNIVERSITY OF CHICAGO

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In the work of this laboratory upon the abnormalities in behavior of salts in aqueous solutions with respect to their ionization, it seemed desirable to determine the effect of mixing salts with common ions. Since in this laboratory we have a potentiometer system which gives